

CLAIMS

1. Process for the transfer of at least one thin film (25) of solid material delimited in an initial substrate (20), characterized in that it comprises the following steps:

- 5 -a step in which a layer of inclusions (21) is formed in the initial substrate at a depth corresponding to the required thickness of the thin film, these inclusions being designed to form traps for gaseous compounds which will subsequently be implanted;
- 10 -a subsequent step for implantation of the said gaseous compounds, in a manner to convey the gaseous species into the layer of inclusions (21), the dose of the implanted gaseous compounds being sufficient to cause the formation of micro-cavities likely to form a
- 15 fracture plane along which the thin film (25) can be separated from the remainder of the substrate (20).

2. Process for the transfer of at least one thin film according to Claim 1, characterized in that the step of implanting said gaseous species is carried out

20 with an implantation energy of these gaseous species that is such that their mean depth of penetration into the substrate (20) corresponds to the depth of the layer of inclusions (21).

3. Process for the transfer of at least one thin

25 film according to claim 1, characterized in that the step of implanting said gaseous species is carried out with an implantation energy of these gaseous species that is such that their mean depth of penetration into the substrate (20) is close to the layer of inclusions

30 (21), this implantation being associated with a diffusion heat treatment to allow migration of the implanted species to the layer of inclusions (21).

4. Process for the transfer of at least one thin film according to any one of claims 1 to 3, characterized in that the initial substrate is composed of a solid part supporting a film structure in which
5 the said thin film of solid material must be delimited.

5. Process for the transfer of a thin film according to claim 4, characterized in that all or part of the said structure is obtained by epitaxy.

6. Process for the transfer of a thin film
10 according to one of claims 4 or 5, characterized in that the said structure is such that the remainder of the substrate (which may or may not be an epitaxy carrier) can be reused after the thin film has been transferred, for another thin film transfer.

15 7. Process for the transfer of a thin film according to any one of claims 4 to 6, characterized in that the inclusions layer is formed by a film deposition technique.

8. Process for the transfer of a thin film
20 according to claim 7, characterized in that the inclusions layer (3) consists of generating columns.

9. Process for the transfer of a thin film according to claim 7, characterized in that the inclusions layer (7) consists of generating grain
25 joints.

10. Process for the transfer of a thin film according to any one of claims 1 to 6, characterized in that the said inclusions have a chemical affinity with the said gaseous compounds:

30 11. Process for the transfer of a thin film according to any one of claims 1 to 6, characterized in that the said inclusions originate from a parametric mismatch of the material forming the inclusions layer with regions of the substrate which are adjacent to it.

12. Process for the transfer of a thin film according to any one of claims 4 to 6, characterized in that the inclusions layer is formed by a technique of etching a layer (15) of substrate (13).

5 13. Process for the transfer of a thin film according to any one of claims 1 to 6, characterized in that the inclusions layer is formed by implantation of elements in a layer of the substrate.

10 14. Process for the transfer of a thin film according to claim 13, characterized in that the said implantation of elements is assisted by heat treatment capable of increasing the efficiency of the traps.

15 15. Process for the transfer of a thin film according to claim 13, characterized in that the morphology of inclusions is modified by a heat treatment.

20 16. Process for the transfer of a thin film according to any one of claims 4 to 6, characterized in that the inclusions layer is obtained by heat treatment of the film(s) in the film structure.

17. Process for the transfer of a thin film according to any one of claims 4 to 6, characterized in that the inclusions layer is obtained by application of stresses to the film(s) of the film structure.

25 18. Process for the transfer of a thin film according to any one of claims 1 to 17, characterized in that the gaseous compounds are implanted by bombardment of compounds chosen among neutral compounds and ions.

30 19. Process for the transfer of a thin film according to any one of claims 1 to 17, characterized in that the gaseous compounds are implanted by a method chosen from plasma assisted diffusion, thermal diffusion and plasma assisted diffusion combined with

thermal diffusion and/or diffusion assisted by electrical polarization.

20. Process for the transfer of a thin film according to any one of claims 1 to 19, characterized
5 in that it comprises a heat treatment step capable of weakening the substrate in the inclusions layer to enable separation between the thin film (25) and the remainder of substrate (26).

21. Process for the transfer of a thin film
10 according to any one of claims 1 to 20, characterized in that it also comprises a step in which the thin film (25) delimited in the substrate is put into intimate contact with a support (23) to which the thin film will bond after it separates with the remainder (26) of the
15 substrate.

22. Process for the transfer of a thin film according to claim 21, characterized in that the said intimate contact is obtained by wafer bonding.

23. Process for the transfer of a thin film
20 according to any one of claims 20 to 22, characterized in that the heat treatment step that weakens the substrate is done by pulse heating.

24. Process for the transfer of a thin film according to any one of claims 1 to 23, characterized
25 in that it includes the use of mechanical stresses to contribute to separation between the thin film and the remainder of the substrate.

25. Application of the process according to any one of claims 1 to 24 to the transfer of a thin silicon film
30 from an initial substrate.

26. Application of the process according to any one of claims 1 to 24 to the transfer of a thin film of III-V semiconducting materials starting from an initial substrate.

27. Application of the process according to any one of claims 1 to 24 to the transfer of a thin film itself composed of a structure made of thin films.

28. Application of the process according to any one
5 of claims 1 to 24, characterized in that the thin film was at least partially treated before it was transferred to form, on all or part of the film to be transferred, an integrated circuit on it.

29. Application of the process according to any one
10 of claims 1 to 24, characterized in that the thin film was at least partially treated before it was transferred to form, on all or part of the film to be transferred, an optoelectronic component on it.